CS101C Homework 3

Due: Wednesday, Apr 23, 2PM (firm)

Collaboration: Any collaboration is allowed while solving the problems in this homework, but you have to write down your homework submission on your own.

Note: since we only had one lecture, this homework is short.

Reminder: in class on Monday (Apr 14th) we covered 3 "levels of reasoning" with respect to λ-calculus:

1. "Object language" of λ-calculus: variables (x, y, ...), λ-abstractions ($\lambda.\cdots$) and application.

2. "Meta-language" that includes the object language, as well as *meta-variables* ($t[]$, $t[\cdots]$, $t[\cdots;\cdots]$, ...) and $\leftrightarrow$ term equivalence specifications.

3. Informal language for describing semantics of meta-language that includes things like "terms with holes in them" ($t[\bullet]$) and "equations" for "terms with holes" (for example, $t[y] = \lambda x.(x\,y)$ or, equivalenlty, $t[\bullet] = \lambda x.(x\,\bullet)$).

Problem 1 (and only): For each of the following pairs of a meta-term and an object term:

1. $\lambda x.t[x;y]$ and $\lambda x.x$

2. $\lambda x.\lambda y.\lambda x.t[x;y]$ and $\lambda x.\lambda y.\lambda z.(x\,y)$

3. $t[]\,t[]$ and $x\,\lambda x.x$

4. $\lambda x.\lambda y.t_1[x;t_2[y]]$ and $\lambda u.\lambda v.(v\,(u\,\lambda x.x))$

write down whether the meta-term matches the object term. In case it does match, write down the "values" of all the relevant meta-variables that make the match possible. In case there are several possible values, write down one, and mention that it is not unique.

Submission: please bring you homework submissions to the lecture on Wednesday, Apr 23 or (if you are unable to come to the lecture) put it into Xin Yu's or Aleksey Nogin's mailbox (Jorgensen, 2nd floor).